

Notes 12/2 - Solving Exponential Equations

■ Step 1: Both sides of the equation must have the same base. Rewrite one or both sides when necessary.

■ Step 2: Set exponents equal to each other. (Ignore the base!)

■ Step 3: Solve your equation from step 2.

Examples:

$$1) 4^{x+2} = 4^5$$

$$s1 \checkmark \quad s2: x+2 = 5$$

$$\begin{array}{r} -2 \quad -2 \\ \hline \end{array}$$

$$s3: \quad \boxed{x=3}$$

$$4) 3^{x+4} = \frac{1}{27} = \frac{1}{3^3}$$

$$3^{x+4} = 3^{-3}$$

$$\begin{array}{r} x+4 = -3 \\ -4 \quad -4 \\ \hline \end{array}$$

$$\boxed{x=-7}$$

$$2) 8^{3x+1} = 8^{x-6}$$

$$3x+1 = x-6$$

$$\begin{array}{r} -x \quad -x \\ \hline \end{array}$$

$$2x+1 = -6$$

$$\begin{array}{r} -1 \quad -1 \\ \hline \end{array}$$

$$\cancel{2x} = -\frac{7}{2}$$

$$\boxed{x = -\frac{7}{2}}$$

$$3) 7^{2x+1} = 1$$

$$s1: 7^{2x+1} = 7^0$$

$$2x+1 = 0$$

$$\begin{array}{r} -1 \quad -1 \\ \hline \end{array}$$

$$\cancel{2x} = -\frac{1}{2}$$

$$\boxed{x = -\frac{1}{2}}$$

$$5) 4^3 = 8^{x+1} \quad * 4 \text{ and } 8 \text{ are both powers of } 2$$

$$(2^2)^3 = (2^3)^{x+1}$$

$$s1: 2^6 = 2^{3(x+1)} = 2^{3x+3}$$

$$s2: \begin{array}{r} 6 = 3x+3 \\ -3 \quad -3 \\ \hline \end{array}$$

$$\frac{3}{3} = \frac{3x}{3}$$

$$\boxed{x=1}$$